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E2A
(71) Applicant
Robert Eisler,
87, rue de la Fraternité,
Montreuil (Seine Saint
Denis), France
(72) Inventor
Robert Eisler
(74) Agent
D. Young & Co.,
10 Staple Inn, London,
WC1V 7RD

(57) Elastic Strap Provided with a Hook

(57) An elastic strap (1) has an end hook (2) moulded thereon. The hook has an insert (6) extending through a curved portion (3) and into a body portion (4) holding the strap end. The insert lies at an angle to the axis of the body.

The strap end is deformed before the hook is injection moulded thereon e.g. by means of pinching blades on the mould. This improves bonding between strap and hook.

The hook preferably has a resilient latch (5).

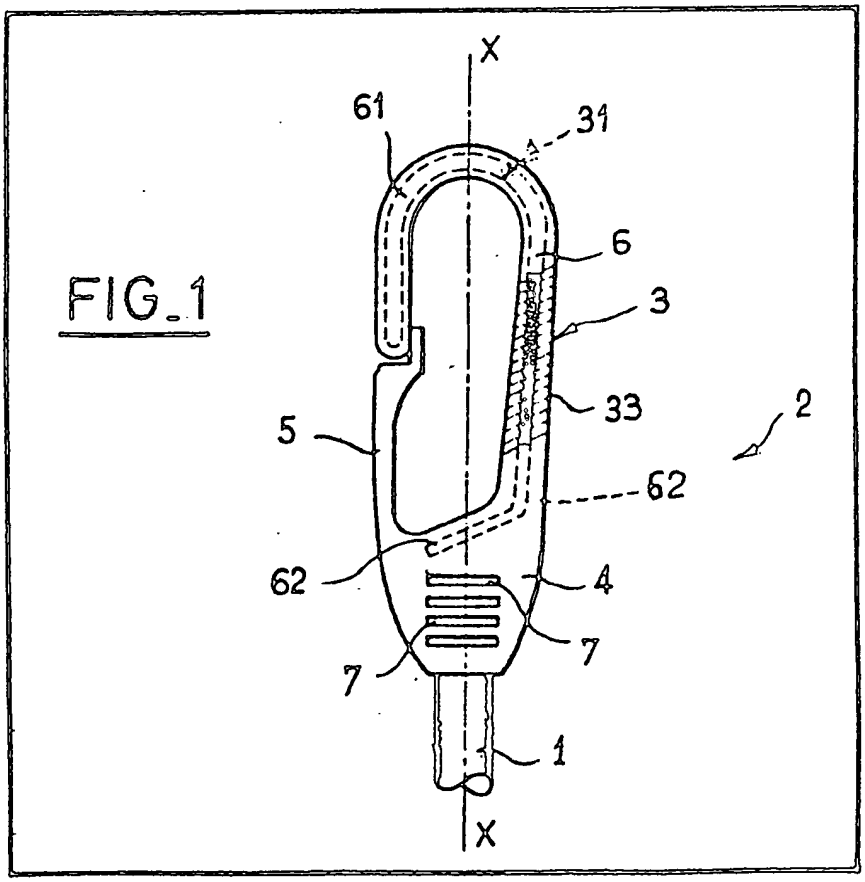
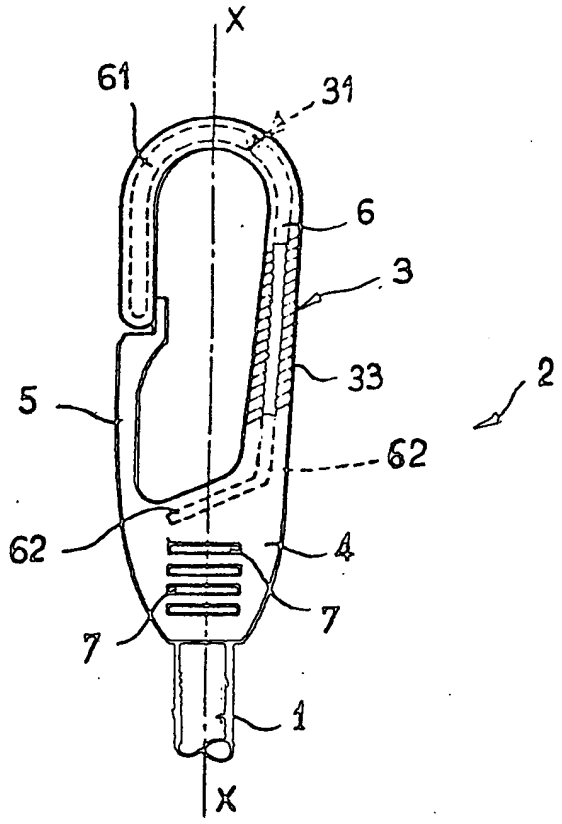


FIG_1

GB 2 058 901 A

FIG_1



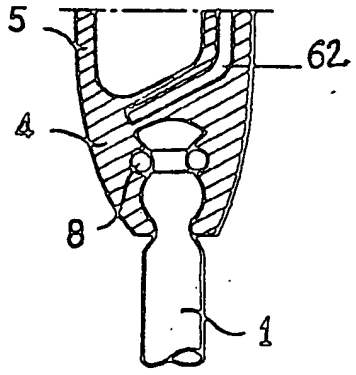


FIG_3

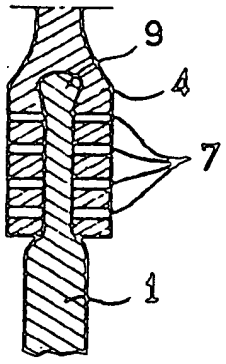
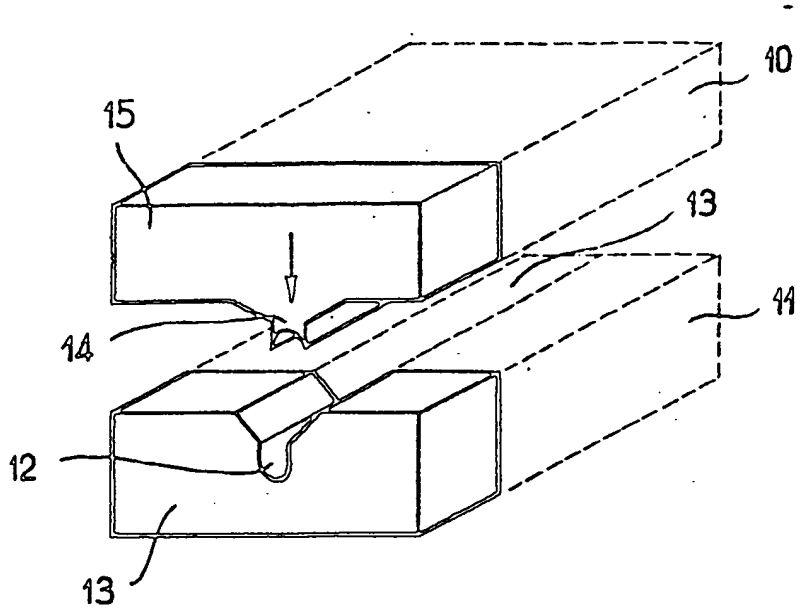


FIG_2

FIG_4



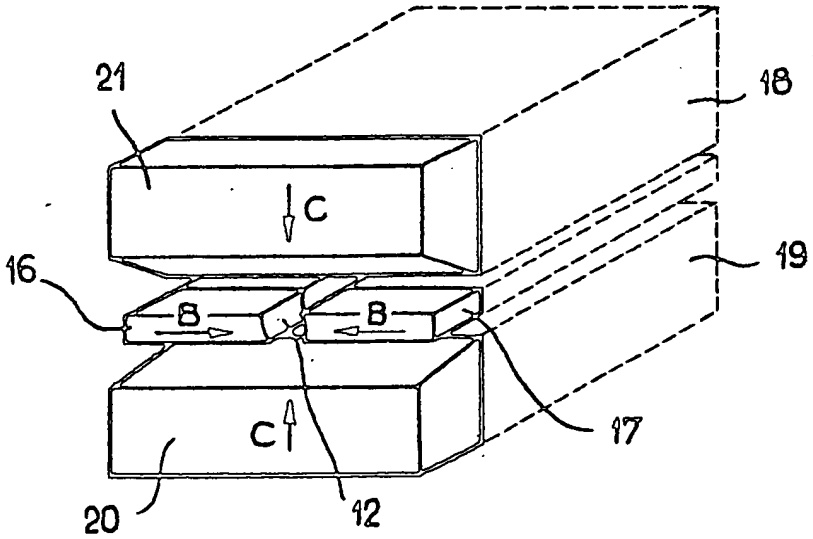


FIG_5

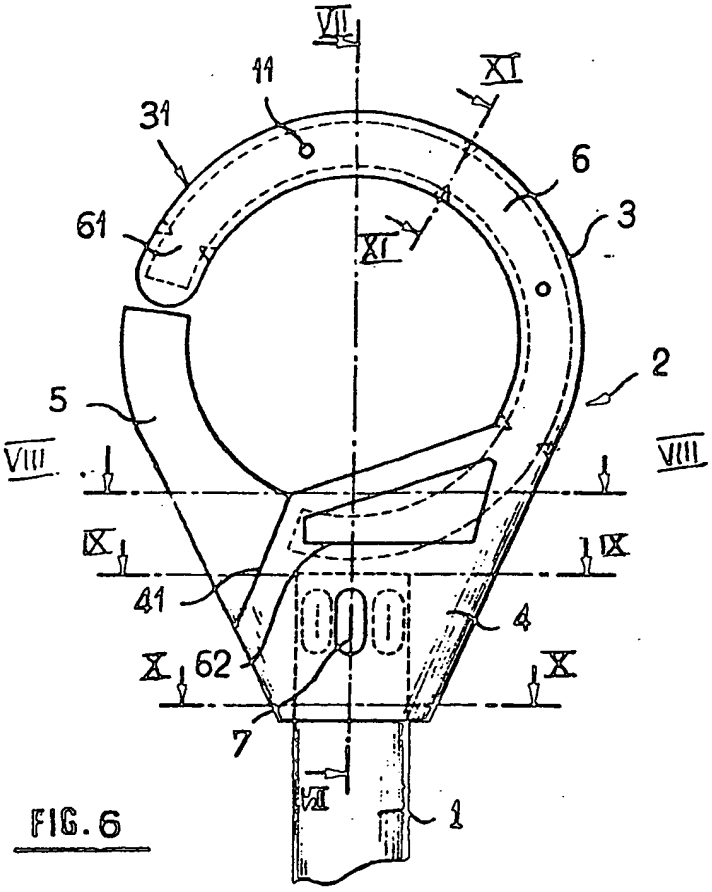


FIG. 6

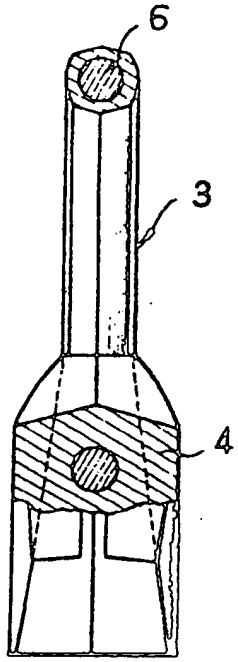


FIG. 7

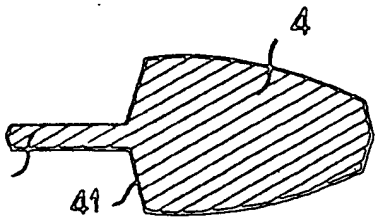


FIG. 8

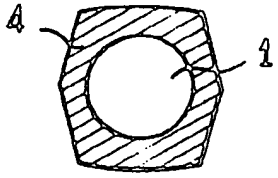


FIG. 10

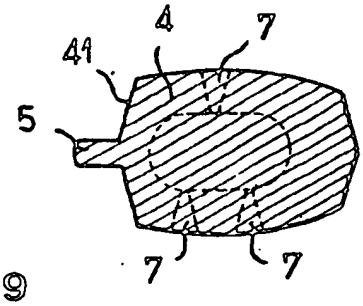


FIG. 9

FIG. 11

SPECIFICATION

Elastic Strap Provided with Hooks, and a Process and Tool for Producing Such a Strap

The present invention concerns an elastic strap or cord provided with hooks, and a process and a tool for producing such a strap or cord.

The invention concerns in particular an elastic strap or cord which is formed at least by an elastic elongate member of which at least one end is provided with a hook, for example a snap-type hook.

Various types of elastic straps or cords exist at the present time. The first type of elastic straps produced comprise an elastic member formed by a bunch of elastic strands, which is surrounded by a braided sheath. At each end of such an elastic strap or cord, there are hooks which are formed by a rigid metal wire which is wound around the end and which forms a loop configuration. These straps suffer from a certain number of disadvantages such as weight, the danger of rust when metal wire is not treated, etc. In addition, when such hooks are not provided with a snap engagement means, they are dangerous, as they can become unhooked and can for example become caught in wheel spokes, etc.

Finally, the production of such a hook is relatively complex and consequently expensive.

Elastic straps or cords are also known, in which the hooks are made separately from the elastic member, of synthetic material. Such hooks comprise a tubular or slightly frustoconical portion which is terminated by a hook configuration. In order to produce an elastic strap, the end of the elastic member is slid into the inside of the tubular element which is an integral part of the hook, and then a ring or a clip is crimped on to the end of the elastic member so that the ring comes to bear against the shoulder or the reduced section of the tubular or conical portion, and retains the hook member in position. Although this mode of manufacture remedies a certain number of disadvantages of the first hook-type elastic straps or cords, it is not entirely satisfactory. Indeed, the hook which is of synthetic material is relatively fragile; when the strap is not stretched, the hook slides on the elastic member and does not always remain fixed to the end thereof. Finally, the manufacturing process includes a certain number of assembly operations which must necessarily be carried out by hand, and this makes this manufacturing process expensive.

The aim of the present invention is to provide an elastic strap or cord which overcomes the above-indicated disadvantages, and a process and a tool for the production of such a strap or cord.

For this purpose, the invention concerns an elastic strap or cord of the above-indicated type, characterised in that the hook which is made of injected material comprises a loop connected to a body which is moulded on the elastically deformed end of the elastic member, an insert being provided in the interior of the loop.

In accordance with another advantageous feature of the invention, the end of the insert which is in the body of the hook is curved so as not to be parallel to the axis of the elastic member or the hook.

In accordance with another feature, the end of the insert is bent in such a way as actually to intersect the axis of the hook.

In accordance with another advantageous feature, the elastic member is provided with a ring ensuring local deformation.

By virtue of the invention, it is possible to produce the hook in a single operation. The local deformations of the elastic member secure the elastic member on the body of the hook and make it possible to ensure a particularly effective connection which is stronger than the resistance to an opening movement of the hook member.

In accordance with another feature, the invention concerns a process for the production of such an elastic strap or cord, wherein local deformation of the end of the elastic member is effected, an insert in loop form is placed in the mould, and synthetic material is injected into the mould in order to integrally connect the insert and the deformed end of the elastic member.

In accordance with a particularly advantageous feature of this process, the local deformation of the end of the strap or cord is effected, within the mould, by means of opposing blades which locally compress the end of the elastic member and material is injected between the blades in order to maintain local compression after retraction of the blades from the mould. The process according to the invention provides the advantage of being extremely simple to perform. As moreover the insert of the hook and the locally deformed end of the elastic member (which comes into the inside of the mould) are independent, positioning such components is simplified and there is no possiblity of such components being displaced before the mould is closed. Indeed, if, as in the prior art, the insert is secured to the end of the elastic member, for example by forming a ring, practical experience has shown that it was a very frequent occurrence for the insert to lift up, since it was unbalanced, and interfere with closure of the mould, or even cause damage to the mould.

Now, according to the process of the invention, the insert is disposed completely within the mould and it cannot be unbalanced since it is not yet connected to the elastic member. Moreover, the end of the elastic member is at least partially gripped in the fixed part of the mould, at the location of the aperture through which the elastic member passes.

Finally, the invention concerns a tool for the production of elastic straps or cords and carrying out the above-indicated process, such a tool being characterised in that the section of the aperture through which the elastic member passes is smaller than the non-compressed section of the elastic member.

In accordance with another feature, the

aperture through which the elastic member passes is of frustoconical shape, the small section of which is towards the mould cavity.

The invention will be described with reference to the drawings in which:

Figure 1 is a view in partial section of an end of an elastic strap or cord according to the invention,

Figure 2 is a partial section corresponding to Figure 1, showing one type of deformation of the end of the elastic member,

Figure 3 is a sectional view of an alternative form of fixing member according to the invention,

Figure 4 is a diagrammatic view of a first tool for carrying out the process of the invention,

Figure 5 is a diagrammatic view of a second tool for carrying out the process according to the invention,

Figure 6 shows another embodiment of a hook according to the invention,

Figure 7 is a view in section taken along line VII—VII in Figure 6,

Figure 8 is a view in section taken along line VIII—VIII in Figure 6,

Figure 9 is a view in section taken along line IX—IX in Figure 6,

Figure 10 is a view in section taken along line X—X in Figure 6, and

Figure 11 is a view in section taken along line XI—XI of the upper part of the hook.

Referring to Figures 1 and 2, an elastic strap according to the invention comprises an elastic member 1 fixed to a hook 2. The hook comprises a loop 3 connected to a body 4 which is itself connected to the end of the elastic member 1.

The elastic member 1 may be a bunch of strands of rubber which may or may not be surrounded by a braided sheath. It may also be a single elastic strand, with or without a sheath. The loop 3 of the hook 2 is closed by a snap member 5 which is integral with the body 4.

Provided within the loop 3 is an insert 6 of which the upper end 61 is curved in a similar manner to the shape of the loop, while the lower end 62 is only very slightly curved so as to intersect the axis X—X of the hook. Figure 1 shows the marks 7 left by the pinching member which was employed in the mould to produce local deformation of the end of the elastic member 1.

The sectional view of Figure 2 diagrammatically shows the deformation of the end of the elastic member 1 within the body 4.

The pinching member is formed by blades which are close to each other and which compress and locally deform the end 1. When the blades are retracted, the blades leave the visible traces 7 which increase the roughness of the body of the hook; this improves gripping of the hook. When the end of the elastic member 1 is locally deformed in that way, the result is the formation of catch zones for the moulded material.

The blades L are sufficiently close together for the elastic member to be unable to suffer deformation between two marks 7, the whole of the deformation being displaced to the end 9 of the member 1, within the body.

Figure 3 shows an alternative form of deformation of the end of the elastic member 1. In this form, a ring or clip 8 is crimped around the end of the elastic member 1, the other components of the hook being identical.

Depending on the use which is made of the hook, the snap member 5 can be removed, either directly in the moulding operation or in the injection operation, or subsequently by cutting.

It is also possible to cover only a part of the insert 6 and to leave free for example the main part 61 of the insert 6 forming the loop 31. The lower end 62 of the insert 6 is curved so as no longer to be parallel to the axis XX of the arrangement. This is important in order to ensure that the insert 6 and consequently the upper part 31 of the loop 3 cannot turn about the straight section 33 and disengage the end of the loop 31 from the snap member 5.

The magnitude of the local deformations depends on the elasticity of the elastic member and/or the synthetic material used for production of the hook. The local deformation or deformations which secure the end of the elastic member to the body 4 of the hook must withstand a pulling force which is greater than that which causes the loop 31 to open.

In order to produce an elastic strap provided with a hook, the end of the elastic member 1 is disposed in a mould and the mould is closed again, after the insert 6 has been set in place. The blade-shaped members which project within the mould (not shown) compress and locally deform the end of the elastic member. It is particularly important for the blades which provide for such local deformation and which project on both sides of the mould to be close to each other so as to deform the elastic member is such a way as to compress it locally as shown in Figure 2; as the blades are very close to each other and as the blades of the two groups oppose each other, the elastic material (which is virtually incompressible) is displaced towards the free end of the elastic member, that is to say, into the part corresponding to the body 4 of the hook (Figure 2).

The blades permit injection of synthetic material which, after cooling, forms bands for maintaining the local deformation (compression) of the elastic member. When local deformation is produced by combining a ring and blades, the ring will be disposed closer to the end of the elastic member than the portion corresponding to the blades.

The injected synthetic material forms the body 4 and the loop 3, covering the portion 61 of the insert 6 completely or partially, according to requirements. The insert may be of any reinforcing material. It is particularly attractive for the insert to be metal.

In the second form of the process which results in a hook such as that shown in Figure 3, a ring or a collar is first fixed to the free end of the elastic member in order to produce local deformation

thereof. That end of the member 1 is placed in the mould before or after the insert 6 has been positioned therein. The injection operation is then performed, as indicated above.

Although the ring 8 can be of any material, it is preferable to use a metal ring.

Finally, and generally, local deformation of the end of the elastic member can be produced by other means, on the end of the elastic member. for example it is possible to envisage (not shown) opening the end in order at least partially to free the fibres forming the elastic member, in order to inject synthetic material on to the fibres, or to introduce into that end a member of wedge-like configuration, which causes local deformation etc, possibly supplemented by deformation by means of compression by means of a ring and/or compression by the blades of the mould.

Finally, in order to enhance the connection between the body of the hook and the elastic member, it is particularly interesting, when the elastic member has a sheath, to have a heat-fusible sheath or a sheath which welds itself to the synthetic material forming the body 4.

For the purposes of carrying out the process, use is preferably made of a mould such as shown in Figures 4 and 5. This mould comprises two mould portions 10 and 11 with means which make it possible to ensure that the plastics material which is injected under pressure cannot escape by way of the aperature 12 through which the elastic member 1 passes. For that purpose, the aperture 12 is of a section which is smaller than the section of the elastic member 1. The said section may be reduced to an extent such as to deform the elastic member 1 to its limit of elastic deformation. Moreover, the mould is provided with a sealing means.

The aperture 12 which is of frustoconical shape, for receiving the elastic member 1, is such that its small base, as shown in Figure 4, is disposed towards the mould cavity 13.

The aperture 12 is defined by a groove in the member 13 which is fixed with respect to the portion 11, for receiving a lug or projection 14 of complementary shape, which is provided on the member 15 which is fixed with respect to the movable portion 10 of the mould.

In Figure 5, the frustoconical aperture 12 is defined by two members 16 and 17 which are movable laterally and in opposite directions (arrows B) in order to permit the elastic member 1 to be set in position; the mould cavity is defined by the portions 18 and 19 which are also movable in opposite directions (arrows C); the two portions 18 and 19 carry heads 20 and 21 which are fitted on to the portions 18 and 19.

Referring to Figures 6 to 11, the elastic strap or cord comprises an elastic member 1' fixed to a hook 2'. The hook 2' comprises a loop 3' connected to the body 4'. The end of the elastic member 1' is fixed to the body 4'. This fixing action is effected by local deformation of the end of the elastic member 1'; this residual deformation is produced by means of pinching members (not shown) which leave traces or marks 7' on the body 4'. In the embodiment illustrated, there is one mark 7' on the front face of the body 4' and two marks on the rear face. The two rearward marks are shown in broken line. The arrangement of the marks is such that, when projected on to the plane of symmetry of the hook, the marks are aligned as indicated in Figure 8.

The loop 3' of the hook is reinforced by an insert 6' in the form of a circular arc. The insert 6' is of a length such that its lower end 62' is positioned on the axis of the elastic member 1', and its other end 61' reaches to the end 31' of the loop 3'.

Figure 6 shows the holes 111' of substantially conical shape, which correspond to the mark of the lugs or points which are provided within the mould for positioning the insert 106' in the moulding operation. The points or lugs are so distributed as to provide at least three support points for supporting the insert, as shown diagrammatically in Figure 11.

The hook is closed by a snap member 105' which is much smaller in section than the loop and the body, as the only function of the snap member 105' is to close the loop. As shown in Figure 8, the snap member 105' is of rectangular section, with its long sides parallel to the plane of symmetry (being the plane of the sheet in Figure 6). This makes it possible for the snap member 105' to be deformed and elastically displaced towards one side or the other of the plane of symmetry, by opening the hook. The end 31' of the loop is rounded while the end of the snap member, which faces the end of the loop, is substantially flat.

The junction between the body 4' and the snap member 5' is made by means of a junction surface 41'.

Figure 7 shows a view in partial section of the arrangement of the various components and in particular the insert 6' in the loop 3' and in the body 4'. The sectional views in Figures 8, 9 and 10 show the shape of the body 4' in different sectional planes, and the junction between the body 4' and the member 5'.

As indicated above, the sectional view in Figure 11 shows the positioning of the insert in the loop and in particular the marks 11' of the lugs or points for positioning the loop in the mould.

In accordance with an advantageous embodiment, the insert 6' is circular in section.

The production and moulding of such a hook on the end of an elastic member are simple and inexpensive operations.

First of all, the insert 6' is of a simple geometrical shape as it is a portion of a ring or a circular arc, of steel, with a circular section. The shape of the hook is itself relatively simple, which reduces the manufacturing cost of the mould. As the snap-action member is simple in shape, and as there is no interlocking engagement with the corresponding end of the hook, the moulding

operation is a simple one, without it being necessary, upon removal from the mould, for the snap-action member to be engaged into the corresponding end of the hook, this being an operation which is necessary in regard to certain snap member-type hooks.

Moreover, the opening of the loop is relatively wide, since the snap-action member moves away laterally, that is to say, perpendicularly to the plane of Figure 6, contrary to snap-action members which are interlockingly engaged with the hook and which fold rearwardly in the same plane as the plane of the hook. In the latter case, the opening in the loop is relatively small, especially as the hook is not circular but is elongate in shape.

Finally, the insert is very inexpensive to produce as it is a component which can be produced by a mass production process, without requiring a number of successive operations of cutting, bending, etc.

Finally, positioning of the insert is very simple since the insert comes to rest on the lugs or points provided in the mould; as the insert is circular in section, it is automatically positioned on the lugs or points which preferably provide a three-point supporting action.

Claims

1. An elastic strap comprising an elongate elastic member of which at least one end is provided with a hook wherein the hook comprises a loop connected to a body which is moulded on the end of the elastic member which is locally deformed, an insert being provided within the loop.

2. A strap according to claim 1 wherein one end of the insert which extends into the body of the hook is bent so as not to be parallel to the axis of the end of the elastic member or the hook body.

3. A strap according to claim 2 wherein the end of the insert intersects the axis of the hook.

4. A strap according to claim 1, 2, or 3 wherein the end of the elastic member is surrounded by a ring providing the local deformation.

5. A strap according to any of claims 1—4 wherein the insert and the loop are in the shape of a circular arc.

6. A strap according to claim 5 wherein the insert has a substantially circular cross-section.

7. A strap according to any of claims 1—6 wherein the hook has a resilient latch.

8. A strap according to claim 7 wherein the latch is a blade portion which is disposed opposite the end of the hook, the blade portion being of an elasticity which permits it to bend to either side of the plane of symmetry of the hook.

9. A strap according to claim 8 wherein the latch is of rectangular section, with its longer sides parallel to the plane of symmetry.

10. A strap according to any of claims 1—9 wherein the hook is of hexagonal section.

11. A process for the production of elastic straps according to claim 1 in which local deformation of the end of the elastic member is effected, an insert in the form of a loop is placed in mould, and mouldable material is injected into the mould in order to secure together the insert and the deformed end of the elastic member.

12. A process according to claim 11 wherein the deformation of the end of the strap is produced within the mould by means of opposing blades which locally compress the end of the elastic member, and the mouldable material is injected between the blades in order to block the local deformation when the material sets.

13. A process according to claim 11 wherein the end of the elastic member is locally deformed before being introduced into the mould, by means of a ring or a clip.

14. A process according to claim 11 wherein the end of the elastic member is provided with a ring and said end is also deformed by compressing it by means of the mould.

15. A process according to any one of claims 11 to 14 wherein the injected material is welded to braid surrounding the elastic member.

16. A tool for the production of elastic straps according to any one of claims 1 to 10 and for carrying out a process according to any one of claims 11 to 15 comprising two mould portions defining a mould cavity with an aperture through which the elastic member extends out of the mould, the section of the aperture for receiving the elastic member being less than the section of the un-compressed elastic member.

17. A tool according to claim 16 wherein the aperture for receiving the elastic member is of a frustoconical shape, with the smaller end thereof adjacent the mould cavity.

18. A tool according to claim 16 or 17 wherein, in the part of the mould cavity receiving the end of the elastic member, each of the two mould portions comprises blades to compress the elastic member.

19. A process according to any of claims 11 to 15 in which an insert of substantially circular section is used, wherein the mould has projecting points at the location of those parts of the mould for moulding the hook, said points serving to support the insert, before the injection operation.

20. An elastic strap constructed and arranged substantially as hereinbefore described with reference to Fig. 1 and 2, or 3, or 6—11 of the accompanying drawings.

21. A process for producing elastic straps substantially as hereinbefore described.

22. A tool for forming an end hook on an elongate elastic member constructed and arranged substantially as hereinbefore described and shown in Fig. 4 or Fig. 5 of the accompanying drawings.

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